M11 J7a

Essex County Council

Appraisal Specification Report – Stage 4/5

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M11 J7a

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1 Introduction

1.1 Background

1.1.1 Harlow, Epping Forest, Uttlesford and East Hertfordshire District Councils are currently evaluating existing and future development needs and five-year housing supplies in accordance with the requirements of the National Planning Policy Framework. They are at various stages of the process and the outcome will undoubtedly result in significant housing and employment growth within and around Harlow, Bishop's Stortford and Stansted Airport. Table 1-1 below presents the recent levels of population and jobs within the study area.

Table 1-1: Population and Jobs

District	Population[1] (2016)	Jobs[2] (2015)
Harlow	86,000	46,000
East Herts	146,300	73,000
Uttlesford	86,200	46,000
Epping Forest	130,300	55,000

Source: Nomis Official Labour Market Statistics, 2015/16

1.1.2 Broxbourne and Enfield District Councils are also evaluating their housing and employment needs. Although these districts are not within the immediate area of influence their development needs have been considered in the development of the Harlow Transport Model (HTM).

1.1.3 Harlow has only one connection to the Strategic Road Network via the M11 Junction 7, which is located to the south and east of the town. With high levels of traffic using this one route, congestion is common with impacts, even from minor incidents, often causing severe congestion across the town's wider road network. This is exacerbated by the location of the existing key employment areas, towards the north and west of the town, which creates further strain on the current local road network, particularly along the A414.

1.1.4 Preliminary evaluation work relating to Uttlesford Local Planning also highlighted concerns for the M11 J8, with committed and planned growth from Stansted Airport, East Herts and Uttlesford likely to result in additional peak period pressure at this junction.

1.1.5 Essex County Council (ECC) is seeking to further develop the evidence base supporting a range of future transport schemes and investments across the County. The evidence should also be able to support future and continued engagement with central government and the South East Local Enterprise Partnership (SELEP), be amenable to future scheme changes, and be capable of supporting the evidence pathway for major scheme business case development as part of the next steps of any funding bid.

1.1.6 The proposed Junction 7a to the east of Harlow will help alleviate these problems with the following specific objectives:

- To improve accessibility to and from Harlow;
- To ensure the proposed infrastructure is the appropriate scale for future traffic demands;

[1] Population estimates – local authority based by five-year age band, 2016

[2] Job density – Total job estimates by local authority, 2015

- To facilitate future housing developments around Harlow and employment growth to the east of Harlow; and
- To reduce congestion primarily for the A414 corridor.

1.1.7 Additionally, the scheme would help to support development of the London-Harlow-Stansted-Cambridge-Peterborough corridor, an area which has been identified as having the potential to drive national growth.

1.1.8 The emerging Harlow Local Development Plan highlights that the inability of the existing transport system is the biggest single barrier to accommodating the level of growth needed in Harlow. M11 J7 is operating close to its planned capacity, which is recognised by Highways England (HE) as they required a cap on the number of new jobs permitted within the Harlow Enterprise Zone until network capacity issues are addressed.

1.2 The Transport Appraisal Process

1.2.1 This Appraisal Specification Report (ASR) covers work to be undertaken for Stage 4/5 of the Project Control Framework (PCF) process. The stage revisits the future year modelling of the scheme using updated development and infrastructure assumptions as of June 2017. Stage 4/5 also revisits the economics studies undertaken during Stage 3, specifically covering Social and Distributional Impacts (SDI), Wider Impacts, Environmental Impacts and Regeneration.

1.2.2 Findings from the Stage 4/5 traffic modelling and economic studies will be used to update the Outline Business Case (OBC) and at this time it is assumed that they will also be used to provide the traffic modelling inputs to the Full Business Case (FBC). It is proposed to undertake further economic studies for the FBC and these will be the subject of a later version of the ASR once the work outlined in this ASR has been completed.

1.2.3 Work to develop the M11 Junction 7a scheme and the HTM, in which to understand the likely traffic impacts of the scheme, began in 2014. Since then the following events and documents have been delivered, covering Stages 1 to 3 of the PCF process[3]

- Public Information Event, Summer 2015;
- Option Assessment Report, May 2016;
- Interim Outline Business Case (IOBC), May 2016;
- Public Consultation, Summer 2016;
- Data Collection Report, July 2016;
- Local Model Validation Report (LMVR), March 2017;
- Model Forecasting Report (MFR), March 2017;
- Economic Assessment Report (EAR), August 2017;
- Outline Business Case (OBC), August 2017;
- Appraisal Specification Report – Summer 2016 (written in March 2017); and
- Planning Application submitted, January 2017.

1.3 Purpose of this Document

1.3.1 This report sets out the methodology for further appraisal of the M11 Junction 7a scheme to support an updated OBC for Stage 4/5 of the PCF process, covering the following items:

[3] Where updated versions of documents have been issued, only the latest one has been listed here to avoid confusion.

1.3.2 The proposed approach to modelling and forecasting;

1.3.3 The proposed methodology for assessing each of the sub-impacts presented within the Appraisal Summary Table (AST); and

1.3.4 The proposed level of design or specification which will inform the cost estimation, and how better information on the cost of the options will be obtained.

1.3.5 The specification described in this report is produced for review and approval and details may change with updated guidance, further work and discussion with key stakeholders. It follows Highways England guidance contained in the Interim Advice Note (IAN) 176/13 and also follows the DfT's WebTAG. The overall methodology is based on best judgement and interpretation of how the guidance might apply to the specific circumstances and detail of the scheme.

1.4 Report Structure

1.4.1 The remainder of this document is set out as follows:

- Chapter 2 – identifies the scenarios to be tested and the key modelling considerations applicable to this study;
- Chapter 3 – sets out the suitability of the HTM to assess the scheme; drawing on the LMVR and identifying some areas for proposed development of the model;
- Chapter 4 – sets out the approach used to develop the Variable Demand Model;
- Chapter 5 – sets out the operational assessment that has taken place;
- Chapter 6 – highlights the approach to forecasting the transport impact of the scheme;
- Chapter 7 – details the methodology proposed for undertaking the economic appraisal of the scheme; and
- Chapter 8 – summarises the proposed approach for the appraisal in an Appraisal Specification Summary Table.

1.4.2 This document is intended to be a live document, with periodical updates when required, to ensure the methodology identified within it accords with the approach undertaken to appraise the scheme.

2 Proposed Uses of the Model

2.1 Scenarios to be Forecast and Interventions to be Tested

2.1.1 The HTM has already been used to provide relevant information for the M11 J7a Public Consultation in Summer 2016 and the Planning Application submitted in January 2017. It is now proposed to update the model with the latest development and infrastructure assumptions. The model will be used to assess the latest updated scenarios as of June 2017 to update the OBC. This ASR will be updated in the future to document the use of the model for the FBC, although at this stage it is envisaged that no further modelling will be undertaken for the FBC and that only the economic analysis will be updated.

2.1.2 In addition to this the model can be used to assist in evaluating which development sites and what scale of development can be delivered as part of Harlow, Epping Forest, Uttlesford and East Hertfordshire District Councils' emerging Local Plans through a dependent development assessment. This this model is a highway model only, only highway schemes can be considered in this regards.

2.1.3 These four districts form a planning group and have jointly commissioned an assessment of their combined objectively assessed housing need. The Department for Communities and Local Government (DCLG) projected in 2016 that 54,600 homes are required across the 4 districts between 2011 and 2033, an increase from 46,000 as contained within earlier projections. The Local Plans are being developed alongside the development of the J7a scheme, so prior to each stage of the modelling of the J7a scheme, scenarios will be developed by the client from the latest available information, which best represent the likely level of growth within the study area. East Herts' Local Plan will shortly be undergoing examination and both Epping and Harlow anticipate Regulation 19 submissions will be complete in early 2018. The information below provides an overview of the position at the time that this document was written. More information on the exact development scenarios to be modelled can be found in Section 4.2 and will be detailed in the updated Model Forecasting Report (MFR).

2.1.4 Harlow's population has increased by only 1.5% in 40 years[4] and evidence indicates that between 12,000 and 15,000 new homes will be needed to meet Harlow's needs up to 2033. However, the size of its existing administrative boundary only allows for a further 8,900 homes (from previous studies) and so Harlow District Council (HDC) is working with neighbouring districts to consider how unmet housing need can be addressed through the 'Duty to Co-operate'. HDC is also planning to create 8,000-12,000 new jobs through its support of new business investment in the town, and by building on its status as one of 48 Enterprise Zones in England.

2.1.5 East Herts District Council (EHDC), within their Draft District Preferred Options Consultation paper[5], indicate that there is likely to be a need for at least 16,093 additional dwellings over 22 years and between 9,500 and 11,100 jobs up to 2033 within the district. Of particular note, Gilston, located to the north of Harlow within East Herts is planned for up to 3,050 dwellings during the Local Plan period (up to 2033), with a further 6,950 dwellings post 2033.

2.1.6 Uttlesford District Council (UDC) have published their draft Development Plan together with an update, which indicates that 14,100 dwellings and 14,600 jobs would be needed up to 2033[6].

[4] Harlow Local Development Plan Emerging Strategy and Further Options April 2014
http://www.harlow.gov.uk/sites/harlow-cms/files/files/Emerging%20Strategy%20and%20Further%20Options%20consultation%20document.pdf

[5] East Herts District Plan Pre-submission Consultation 2016
https://www.eastherts.gov.uk/media/31315/The-East-Herts-District-Plan-DP/PDF/DP.pdf

[6] Uttlesford District Regulation 18 (Draft) Local Plan
https://www.uttlesford.gov.uk/CHttpHandler.ashx?id=7008&p=0

2.1.7 Passenger numbers at Stansted Airport, which lies within UDC, fell during the 2007-09 economic downturn from a peak of 23.5 million passengers per annum (mppa) in 2007 to 17.5 mppa in 2013, but have seen revived and are now at 25.4mppa[7] (August 2017). The current planning permission is for 35 mppa, and the operators of Stansted Airport, Manchester Airports Group's (MAG's), submission to the Airports Commission indicated that the single runway has a maximum use capacity of between 40 and 45 mppa[8]. It is expected that this passenger cap will be reached in 2028. For the purposes of this assessment, only Stansted passenger growth forecasts to 35 mppa be considered as the aspirational 45 mppa aspirations have not received planning permission.

2.1.8 The Airport is the largest single employment site in the East of England, presently employing over 10,000 people across 200 on-airport companies. The MAG submission further states: "*Previous assessments have indicated that at a throughput of 35mppa there would be around 16,800 on-airport employees, with a further 6,400 jobs being supported direct or indirectly off-airport*."

2.1.9 Epping Forest District Council's initial consultation paper on their Local Plan from 2016 included a maximum level of 11,400 homes and approximately 10,000 jobs up to 2033[9]. It was anticipated that several EFDC housing developments may be located on the outskirts of Harlow.

2.1.10 Of particular significance are the emerging proposals for a series of Garden communities along the A120 in Uttlesford district, North Essex and Harlow, the latter of which is known as the Harlow and Gilston Garden town. These developments are expected to increase pressure along the A120 and at M11 junctions.

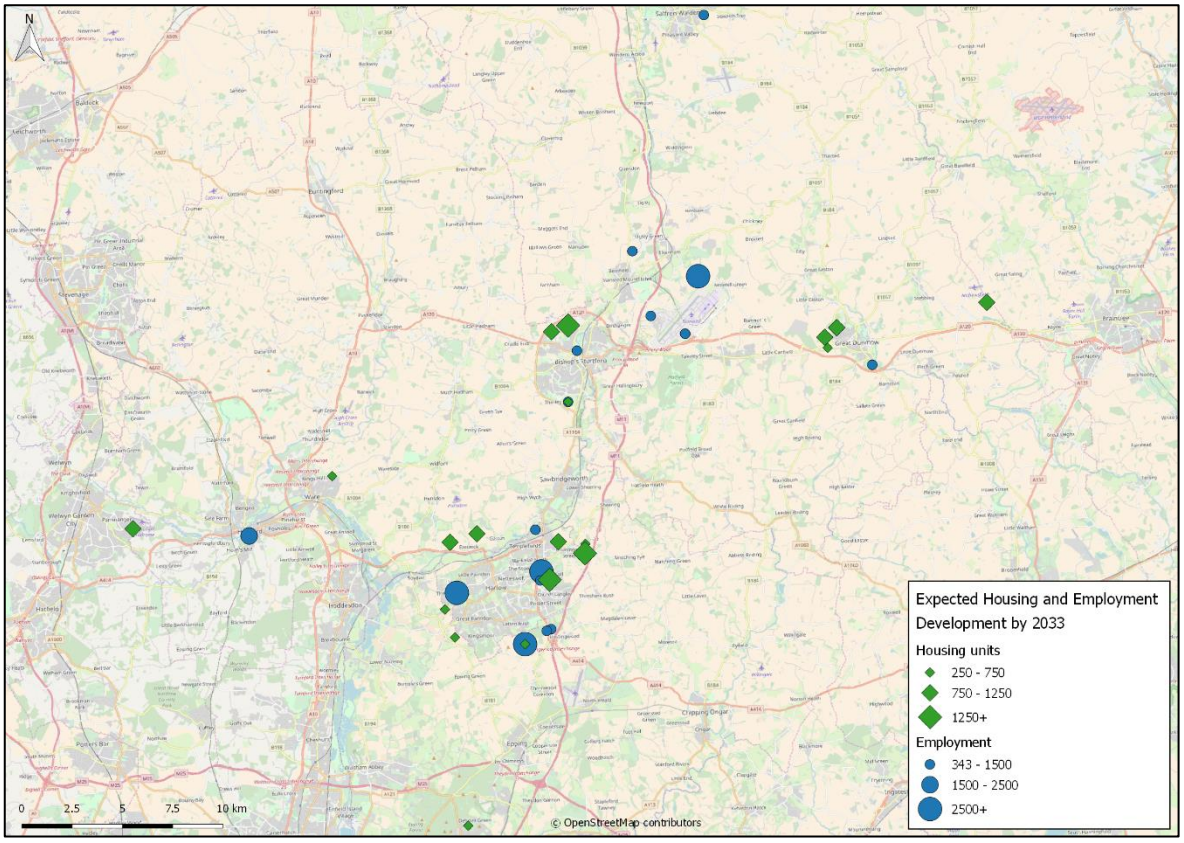
2.1.11 The location of some of the proposed large scale developments across the four districts and within the modelled area that have been identified for inclusion in the forecast modelling are shown in Figure 2-1 below.

[7] http://Mediacentre.stanstedairport.com/summer-getaway-sends-passenger-numbers-soaring-to-record-highs-at-london-stansted

[8] Capacity for Growth", MAG's submission to the Airports Commission, July 2013

[9] Epping Forest District Draft Local Plan Consultation 2016
http://www.efdclocalplan.org/wp-content/uploads/2017/07/n_17366_Epping-Forest-Draft-Local-Plan-SINGLE-AW-LR-2-2.pdf

Figure 2-1 Proposed Development Locations



Contains Ordnance Survey data © Crown copyright and database 2017

2.1.12 A number of transport infrastructure schemes have been identified in order to relieve existing congestion in Harlow and to facilitate growth. The HDC Emerging Strategy also states that "*HDC, in partnership with ECC, is promoting a new junction on the M11 (J7a). Without this part of the Enterprise Zone and substantial additional growth (housing and commercial) to meet the needs of the community cannot be delivered.*"

2.1.13 A Highways England report produced in 2014 identifies that there are issues with M11 J7 and J8, and acknowledges that there is evidence to show that the provision of J7a could relieve pressure on J7 and J8[10]; Figure 4 of the report shows both junctions as key challenges. While interim short term capacity improvements for J7 have been identified by ECC to relieve some of the existing congestion, J7a is considered necessary to provide additional access to the SRN and to deliver economic growth.

2.1.14 Interim capacity improvements have also been identified by ECC for J8 to accommodate committed growth. Optioneering is currently being undertaken to identify possible major long-term solutions at J8, which requires improvement to support any further expansion of Stansted Airport.

[10] "London to Leeds (East) route-based strategy evidence report", Highways Agency, April 2014, Table 4.1

2.1.15 There are currently several large studies considering improvements to the A120 towards the A12 (Braintree to Marks Tey). Highways England are leading on potential short-term improvements to this section and ECC are leading on the development of a preferred route for a dual carriageway link between Braintree and Marks Tey. Whilst improving the A120 would significantly increase network resilience, this is a longer term aspiration requiring significant investment[11]. Improvements to the A120 could result in more traffic using the A120 to reach the M11 at J8. The aforementioned emerging Garden Towns are also expected to add additional pressure to the A120 and M11.

2.1.16 The A14 scheme which is currently the subject of public consultation would also impact on the Harlow-Stansted-Cambridge Corridor and would be likely to affect flows on the M11 within the study area.

2.1.17 Hertfordshire County Council (HCC) has been allocated funding from the LEP towards construction of the A120 Little Hadham bypass. Planning permission for this scheme was granted in January 2017, with scheme completion expected in 2020[12].

2.1.18 In addition to the wider network schemes listed above there are a number of development-related improvement schemes, which have been identified as necessary to deliver already committed developments, or to deal with existing congestion issues. These schemes are considered committed and are summarised in Table 2-1 below. While some are directly linked to developments, others require funding to be identified before they can be delivered.

Table 2-1: Development Related Highway Improvement Schemes

Scheme Description	Opening Year
Mulberry Green left in left out	2016
A414 / Clocktower Junction Capacity Upgrade	2016
Harlowbury additional site access (Land North of Gilden Way LR298)	2016
A414 / London Road Enterprise Zone New Access and New Hall Link Road (LR 336/337)	2017
A414 First Avenue / Gilden Way Junction Upgrade	2017
A414 Cambridge Road (Gates) Upgrade - including widening Edinburgh Way to 4 lanes	2017
A414 Edinburgh Way / East Road Signal Junction Improvement	2017
London Road closure (except to buses)	2017
Mark Hall School Drop Off to London Road	2017
Access to W Sumners / W Katherines (LR 375 / 333)	2017
A120 Little Hadham By-pass (and associated signal timing changes)	2019
B183 London Road to Harlowbury Upgrade	2021
Lower Sheering Road, local access restriction	2021
Reduced speed limit on Gilden Way	2021
HGV ban through Old Harlow and Churchgate Street	2021
B183 Gilden Way/Sheering Road Roundabout (west of Gilden Way recreation ground)	2021
Old Road closed for through access	2021
M11 J8 short term capacity improvements	2021
A120 / B1383 Capacity Improvements	2021

[11] "A12/A120 route-based strategy", Highways Agency, March 2013, para 4.3.5

[12] https://www.hertfordshire.gov.uk/services/highways-roads-and-pavements/roadworks-and-road-closures/major-roadwork-projects/a120-little-hadham-bypass/little-hadham-a120-bypass-and-flood-alleviation-scheme.aspx

Scheme Description	Opening Year
A120 / A1250 Capacity Improvements	2021
Bishop's Stortford North Development, Access onto Hadham Road (LR 27/28)	2021
Cambridge Road - new access into River Way (Harlow Enterprise Zone LR338)	2021
Signalisation of double mini-roundabout in Sawbridgeworth	2021
Gilden Way (extra eastbound lane)	2021
Sheering Road roundabout (access and part signals to improve access to East Harlow development)	2021
Left turn slip road from J7a link Road approach to the East Harlow northern access road.	2021
Second Avenue / Velizy Avenue Junction Capacity Upgrade	2021
Access to Bishop's Stortford South (LR 26)	by 2021
Access to Playing Field to South of Gilden Way Development (LR316)	by 2021
Accesses to Gilston Park (LR 53)	by 2021
Widening of M25 J25-27	by 2021
Access to Latton Priory (LR 372)	by 2031
A414 west of Eastwick, new development access roundabout (Western Section Gilston Park Estate LR 52)	2022
A414 Eastwick to Burnt Mill dualling	2024
A414 / Eastwick Road Junction Capacity Upgrade	2024
A414 / Fifth Ave junction improvement	2024
Bishop's Stortford North Development, Access onto A120	2026
Bishop's Stortford North Development, Access onto Rye Street x2	2026
Fifth Avenue dualling	by 2036

3 Harlow Transport Model Suitability

3.2 Key Modelling Design Considerations

3.2.1 In order to assess J7a, the traffic modelling needs to identify and evaluate local infrastructure needs, as well as the strategic impacts of the planned development and highway schemes. Thus, the traffic model should extend to an area that is sufficient to assess strategic movements and key route choices as well as local movements within Harlow.

3.2.2 An appropriate modelling package needs to be used for construction of the model and assignment. VISUM has been selected as the most appropriate modelling package for the assessment of M11 J7a because of the speed with which detailed highway networks can be coded and its ability to be able to effectively carry out highway assignments for many scenarios. VISUM also allows for easy extraction of results to spreadsheet and database formats for analysis and checking.

3.2.3 The VISUM model complies with guidance given in Department for Transport (DfT) Web-based Transport Analysis Guidance (WebTAG). Key stakeholders, including Highways England, have been engaged during its development to ensure that the model is an acceptable tool for use in evaluating a range of planning scenarios. The planning scenarios have been developed with advice from the local planning authorities to ascertain the level of certainty around each planned development element.

3.2.4 In addition to the 2014 base year model, 2021 opening year and 2036 design year forecast matrices have been developed.

3.2.5 For the purposes of assessing the proposed M11 J7a scheme it was not deemed necessary to incorporate a public transport model. There was judged to be very little interaction between modes for the impacts of the proposed scheme, and thus little opportunity for modal shift as a direct consequence. As such a highway-only assignment model was developed.

3.2.6 Given the total value of improvements of the M11 J7a scheme exceeds £5m, in line with DfT recommendations, the latest scenario testing for the updated OBC will make use of the Variable Demand Model (VDM) developed for the scheme testing. As significant strategic importance is attached to the M11 J7a scheme for road traffic in Essex, Hertfordshire and the wider region, the VDM is considered necessary to accurately simulate future traffic conditions. Further detail on Variable Demand modelling is covered in Section 3.5 of this ASR.

3.2.7 WebTAG unit M3.1 advocates the development of base year matrices from observed data, with emphasis made on the use of roadside interview data. However, ECC does not permit the undertaking of RSI surveys on their highway network. As such the highway demand has been constructed through the use of aggregated mobile phone data. Full details of the collection and processing of mobile phone data can be found in the LMVR.

3.2.8 The LMVR and ASR covering PCF Stage 3 contain details of the modelling parameters listed below:

- modelled and external study area;
- model zoning system;
- network structure;
- centroid connectors;
- time periods;
- user classes;
- convergence, and;

- calibration and validation.

3.3 Time Periods

3.3.1 The highway assignment model was built to represent three modelled time periods. The modelled hours were derived by analysis of traffic counts around Harlow and Bishop's Stortford. Analysis of this data showed that, in line with WebTAG unit M3.1 guidance, the following time periods should be assessed:

- AM peak hour between 08:00 and 09:00;
- Inter-peak hour between 11:00 and 12:00; and,
- PM peak hour between 17:00 and 18:00.

3.3.2 The inter-peak hour selection was based upon the availability of mobile phone data (the demand data which the model uses) for that specific hour (11:00 – 12:00). Mobile phone data was not collected for other traditional inter-peak hours.

3.3.3 It is considered that both the costs of an off-peak model (with approx. 2% of daily flow each hour) and a weekend model outweigh their separate values and that these periods and the shoulder peaks can be adequately represented through annualisation factors in future appraisal.

3.3.4 This level of detail and the time periods chosen provide a suitable basis for the calculation of required AADTs and AAWTs for noise and air quality modelling, and enable demonstration of scheme impacts required during consultation / engagement with other stakeholders.

3.4 Assessment of Fitness for Purpose

3.4.1 As detailed within the LMVR and ASR for PCF Stage 3, the model assignment for all time periods satisfies the WebTAG %GAP criteria for a well converged model, the %GAP statistics comfortably achieve what is required. Furthermore, the model displays a good level of stability demonstrated through the GEH between turning flows between assignment iterations.

3.4.2 The level of calibration achieved by the model, in most instances, exceeds WebTAG criteria for both individual traffic count locations and for screenlines and cordons. Checks of strategic routing also demonstrate that the model performs well in terms of replicating traffic conditions.

3.4.3 The HTM does not meet the guidelines set out in WebTAG Unit 3.1 for the validation sites chosen. The 85% target for individual count sites hitting both DMRB and GEH criteria is not satisfied, this is due to a range of issues:

- Local routing in Harlow;
- Local routing in Bishop's Stortford; and
- Poor performance of small rural roads to the east of the M11.

3.4.4 Validation screenlines demonstrate a higher level of validation, despite still falling short of the guidelines set out in WebTAG. The North of A120 Screenline passes for all time periods, and for all vehicles with the exception of the southbound direction in the AM period. This is, however a low flow screenline made up of many rural count sites. Furthermore, the screenline is located on the edge of the detailed model area and does not directly interact with the network in proximity to where M11 J7a is proposed.

3.4.5 The Harlow Screenline passes for all time periods, and for all vehicles with the exception of the eastbound direction in the AM period. The East of M11 screenline fails criterion for all vehicles in the eastbound direction in all time periods, whilst also underperforming in the IP in both directions and PM eastbound for cars. However, when assessed using GEH values for the screenline it performs significantly better, achieving a GEH value below 4 for all except the eastbound direction in the PM time period. As with the North of A120 this screenline is also low flow and has many rural links contained within it.

3.4.6 Journey time validation has been shown to exceed WebTAG criteria for all time periods.

3.4.7 The model performs well against the model standards previously set out, including convergence, link flow and screenline calibration and journey times. This should serve to give confidence and provide reassurance that the model is representative of current conditions. However, link flow and screenline validation and sector to sector matrix integrity do not meet criteria set out in WebTAG.The model is primarily intended to be used for modelling a new junction on the M11 and so specifically needs to be fit for this purpose. In the area directly affecting the scheme the model replicates well the observed levels of link flow and routing on A1184, Sheering Lower Road, Sheering Road and Gilden Way. This representation of traffic conditions will ensure that accurate transfer of trips to the scheme occurs in the forecast models.

3.4.8 In addition to the area around the scheme, the model meets link flow calibration at J7 and particular attention has been made to ensure that the main A414 – M11 north–south movement is accurately represented. The flow of trips east and west across Harlow validates to criteria giving further confidence in assessing any network changes in the Harlow area. Routing through the model is also considered to be accurate and checks have been carried out to check that delay is at the correct junctions in the model, particularly in peak periods.

3.4.9 The model has been demonstrated to have been constructed in a manner consistent with guidance and hits an acceptable level of calibration for all aspects of the model build. Validation has been shown to be satisfactory for the purpose of the model. It is therefore expected that a high degree of confidence may be placed in the model for the purposes of assessment and economic and environmental appraisal of a potential new junction on the M11.

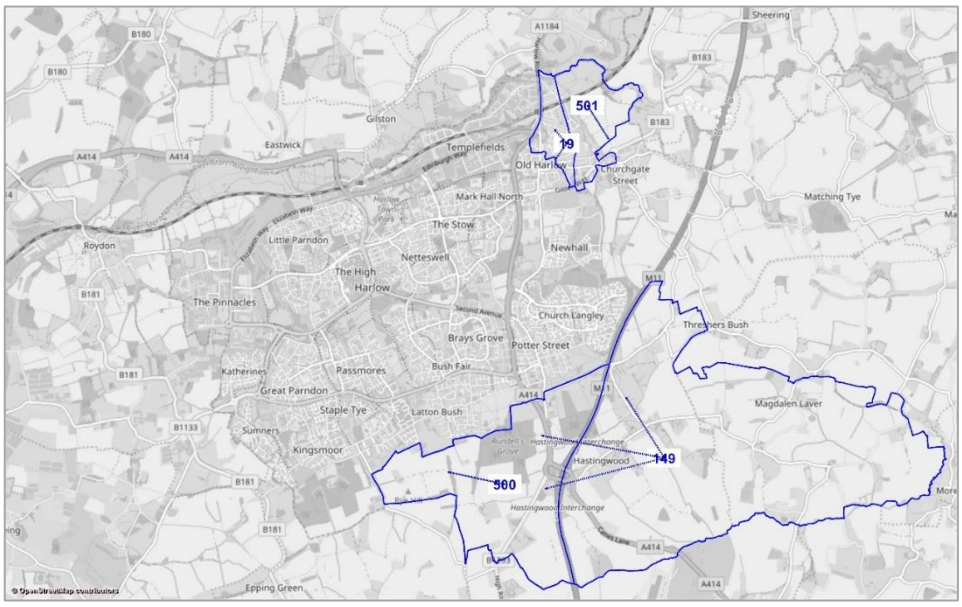
3.4.10 The model was reviewed on behalf of Highways England in October 2015. Following this review, the Variable Demand model component was developed for the Planning Application, along with the following aspects of the model:

- Consideration of the impact of seasonality on traffic data collected;
- Inclusion of fixed flow for local buses;
- Doubling the operator cost factor associated with HGVs;
- Review of the distribution of trips to/from town centre zones;
- Review of the application of connector shares;
- Further calibration, with a focus on turning movements at key local junctions in Harlow;
- Further calibration of HGV routing; and
- Key sections of journey time routes to be considered in validation.

These enhancements were reported in an updated version of the LMVR, as reported above.

3.4.11 Since the Planning Application, two additional zones have been added to the HTM by dividing zones 19 and 149. The new zones, 500 and 501, are reserved for new development only, thereby preserving the integrity of the base model. In line with this, the connectors into these zones have been updated.

Figure 3-1: HTM Updated Harlow Zoning



3.5 Variable Demand Modelling

3.5.1 Variable Demand Modelling (VDM) will be used when undertaking the Stage 4/5 modelling of the M11 J7a scheme. Outputs from the VDM will be used to inform the updated OBC and FBC.

3.5.2 The premise of VDM is that any change in travel cost, through traffic intervention or changes in travel demand is liable to either induce or suppress traffic. The proposed junction improvement on the M11 will likely make journeys quicker and cheaper for existing users by relieving congestion in the network and as such users will either re-route from other less appealing roads, change the destination of travel where previously inaccessible locations now become accessible, or shift travel from public transport to car creating new trips that previously did not exist. The VDM will therefore better model the impact of the M11 J7a scheme on demand behaviour, and in doing so, will provide a more rounded assessment of the highway impact of the scheme.

3.5.3 The VDM has been developed within the VISUM software platform and the specifications used are detailed in the ASR for Stage 3 and the LMVR.

3.5.4 As detailed in WebTAG Unit M2, the VDM was subject to realism testing to ensure that the demand model predicts the changes in the choices within acceptable margins; this is discussed further in the following section of this report. In line with normal practice, only cars have been subjected to the VDM as it is assumed that neither LGV nor HGV flows would be affected by the new scheme other than through route choice.

3.6 Operational Assessment

3.6.1 There have been a number of iterations to assess the operational capacity of the emerging design using localised traffic modelling and network microsimulation of the overarching traffic levels derived from the HTM.

3.6.2 The operational highways and junction capacity assessments considered the core scenario at PCF Stage 3 and the proposed scheme has been designed for that level of growth capacity (i.e. 31,428 dwellings and 23,397 jobs across the four key districts 2014-2033 and trip growth from NTEM of 1.5-2.3% for 2033-36 (varying by time period)). This has been instructed by ECC, the overseeing organisation who is the promoter of the scheme.

3.6.3 To inform design and ensure the proposed scheme operates satisfactorily, an operational assessment of junctions and links has been carried out through an iterative process, ensuring that the proposed highway designs provided sufficient capacity for the level of traffic forecast, both in the proposed opening year of 2021 of the scheme, and for 15 years later in 2036 (design year).

3.6.4 The capacity of the proposed grade separation junction (M11 GSJ) and slip roads have been assessed and designed in accordance with TD22/06. IAN 149 has also been utilised to allow certain relaxations for the required layout types and layout dimensions. Any necessary departures from the requirements of IAN 149 and TD22/06 must be agreed and signed off by Highways England.

3.6.5 Each roundabout and signal controlled junction has been assessed using ARCADY and LinSig respectively, to determine its optimum operational capacity. Where possible, a Ratio of Flow to Capacity (RFC) value for roundabouts at or below 0.85 and Degree of Saturation (DoS) percentage for signal controlled junctions at or below 90% have been considered to indicate satisfactory junction performance which is in line with industry best practice. Queue lengths and journey times have also been assessed for the scheme using VISSIM. The operation of the M11 GSJ has also been assessed using VISSIM to identify any queueing on the slip roads which could result in queueing back on the M11 mainline.

3.6.6 As there are proposals to amend the current layout at Churchgate roundabout to a signalised Hamburger style junction, LinSig has been utilised to develop the proposed signals and assess the capacity of the junction. The signal timings developed in LinSig have also been incorporated into the VISSIM model.

3.6.7 The above operational assessments have been reviewed by Highways England following PCF Stage 3. Highways England have confirmed that no additional operational assessments are required.

4 Forecasting

4.1 Overview

4.1.1 The forecast modelling undertaken to support the M11 J7a Planning Application is detailed in the MFR. It is proposed to adopt the same approach for updating the OBC using updated scenarios and with the addition of a sensitivity test on the core scenario which includes an assessment of 'dependent development'. Following this work, an updated version of the MFR will be issued. This will include a chapter detailing the Variable Demand Model, an assessment quantifying the amount of scheme-dependent development in the core scenario, and additional data forecasting the traffic impact of the proposed scheme on the M11.

4.1.2 For the Stage 4/5 modelling, forecast demand matrices will be created using the detailed forecast methodology developed for the Harlow Local Plan project and used previously to support the M11 J7a Planning Application. This methodology relies on developing trip generation rates for each specified development using the Trip Rate Information Computer System (TRICS). The methodology is a departure from the JTREND methodology used for the earlier Public Consultation work, and which is referenced in earlier iterations of the ASR.

4.1.3 Development trip distribution for housing, employment and schools will be based on the selection of parent zones where appropriate. A parent zone is a zone of similar land use in a similar location, the distribution of the selected parent zone is applied to the development trips. Parent zones will be agreed with ECC.

4.1.4 All these methodologies will be detailed in the updated MFR.

4.2 Growth Scenarios

4.2.1 As stated within Section 2.1, each of the four districts (namely Harlow, Epping Forest, Uttlesford and East Hertfordshire) modelled in the HTM have set out their Local Plan development aspirations up to 2033. It is also important to note that M11 J7a forms an integral and key part of the overall infrastructure provision that will be required to deliver the local plans, although a dependent development assessment has not yet taken place.

4.2.2 The approach as advocated within WebTAG unit M4 is through the development of a core scenario which is a scenario based on the most unbiased and realistic set of assumptions that will form the central case that is presented at a later stage within the appraisal summary table (AST).

4.2.3 The HTM will be used to assess the M11 J7a scheme and as such a 'with scheme' scenario will be developed for appraisal.

4.2.4 Prior to undertaking this work, ECC, the scheme promoters, have provided an updated Uncertainty Log containing three scenarios, which their officers have derived from the latest housing and employment planning information they had obtained from each of the key Districts (as of June 2017, file reference 170529 160914 UL 2021 2033 Core Emerging_V2_2017MY.xlsx):

- a core scenario, based on NTEM 7.2 growth including all completed, permitted, near certain and more than likely developments;
- an ECC most likely alternative scenario, considered at the time by the scheme promoters to be the most likely growth scenario taking into account discussions with District officers and likely achievable build out rates; and
- a high growth alternative scenario based on the Emerging Local Plan.

4.2.5 These scenarios are different from those modelled for the Planning Application and the initial OBC. These new scenarios are based on updated planning information and the updated NTEM forecasts, which ECC feel are more representative of the more than likely growth scenario.

4.2.6 The Districts' Plan periods end in 2033. From a base year of 2014, the model forecast years will be 2021 (scheme opening year), 2036 (design year) and 2051 (for the economic appraisal). Traffic growth up to 2033 with therefore draw on the district Local Plan aspirations. Beyond 2033, NTEM will be used to apply 2033-2036 growth for all three 2036 scenarios and 2033-2051 growth for all three 2051 scenarios.

4.2.7 The core scenario will be based on the distribution of 28,740 dwellings and 18,137 jobs across the four districts as defined within their respective emerging local plans. These aspirations have been constrained to NTEM total growth of 29,717 dwellings and 18,137 jobs across the four key districts 2014-2033. This approach provides growth forecasts which are aligned with NTEM, but with a geographic distribution which mirrors that of the Local Plans.

4.2.8 The ECC most likely growth consists of 37,020 dwellings and 35,576 jobs across the four Districts 2014-2036 and the High Emerging LP growth is based on 45,478 dwellings and 40,555 jobs for 2014-2033 across the four Districts. Further detail is included in the table below.

Table 4-1: Breakdown of Housing and Jobs in the Uncertainty Log for each Scenario 2014-2033

	Core (NTEM)		ECC Most Likely		High – Emerging LP	
	Housing	Jobs	Housing	Jobs	Housing	Jobs
East Hertfordshire	11,645	4,658	13,484	4,922	16,605	5,436
Harlow	5,263	8,531	6,750	8,531	8,108	8,531
Epping Forest	4,209	2,226	10,181	5,631	10,181	7,954
Uttlesford	7,624	4,643	10,584	8,992	10,584	11,135
Four District Total	**28,740 factored to 29,717**	**20,059 factored to 18,137**	**37,020**	**35,576**	**45,478**	**40,555**

4.2.9 Housing and job data for the period 2014-2021 has been identified in the latest development Uncertainty Log and will be referenced in the development of the 2021 scenarios.

4.2.10 The latest Uncertainty Log identifies 21 primary and/or secondary schools attached to sites across the four districts, in total accommodating 11,515 pupils.

4.2.11 The build-out / pupil occupancy level of the schools in 2021 and 2036 across the three growth scenarios, has been determined (where possible) from the assumed build out of housing on the development site that each school is attached to. In the two instances where schools are detached from housing development, it has been assumed that the full allocation of pupils will be modelled for all scenarios.

4.2.12 Growth in trips to/from Stansted Airport between 2014 and 2036 has been extrapolated from information provided by SDG (171031 SDG Airport Forecast_corrected.xls) who in turn have based their analysis on information provided by Manchester Airport Group (MAG), who own Stansted Airport. The forecasts suggest the passenger cap of 35mppa will be reached by 2028. This represents the level permitted by Stansted's current approved planning application. MAG have aspirations for growth to 45mppa in this period, however they have yet to secure planning permission for this. Therefore, no further growth in traffic related to Stansted has been forecast beyond 2028. For the purposes of this study, it has been assumed that airport arrivals and departures will not differ across Local Plan growth scenarios.

Table 4-2: Growth Factors from 2014 for Stansted Airport

	AM		IP		PM	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
2021	1.17	1.20	1.45	1.56	1.05	1.08
2036	1.33	1.41	1.90	2.13	1.11	1.16

4.2.13 Two data sources for the development of forecast growth factors, provided by the DfT are as follows:

- National Trip End Model (NTEM) as currently encapsulated in the software TEMPROv7.2 using Dataset 7.2 for the derivation of traffic growth factors for cars; and
- Road Traffic Forecasts (RTF) based on National Transport Model (NTM 2015) as currently published by the DfT, which is applicable for the derivation of traffic growth factors relating LGV, and other goods vehicles (OGV) classes 1 and 2, grouped together as HGV.

4.2.14 The requirement as set out within WebTAG Unit M4 states that the estimates of demand should be constrained to NTEM (albeit at a district or county level). As detailed above, this is proposed for the core scenario. Constraining to NTEM is achieved by limiting trip totals at the TEMPRO zone level to those forecast in NTEM 7.2. If some zones are increased by a larger amount due to local planning data other zones will need to be reduced down in a commensurate way, to keep the overall total constrained.

4.2.15 Trip growth from NTEM of 1.7%-2.5% for 2033-36 (varying by time period) will be assumed. For the period 2033-2051, trip growth from NTEM of 10.2%-12.2% (varying by time period) will be assumed. All development outside of the key districts will be based on NTEM forecasts.

4.2.16 A sensitivity test on the core scenario will be undertaken, which will take account of dependent development. Appendix A details the methodology that will be employed to identify this dependent development and the scenarios that will be run for economic assessment.

4.2.17 The WebTAG M4 defined High and Low Growth alternative scenarios will also be modelled.

4.3 Forecast Year Networks

4.3.1 For each year and growth scenario, 'without scheme' and 'with scheme' scenarios will be created as follows:

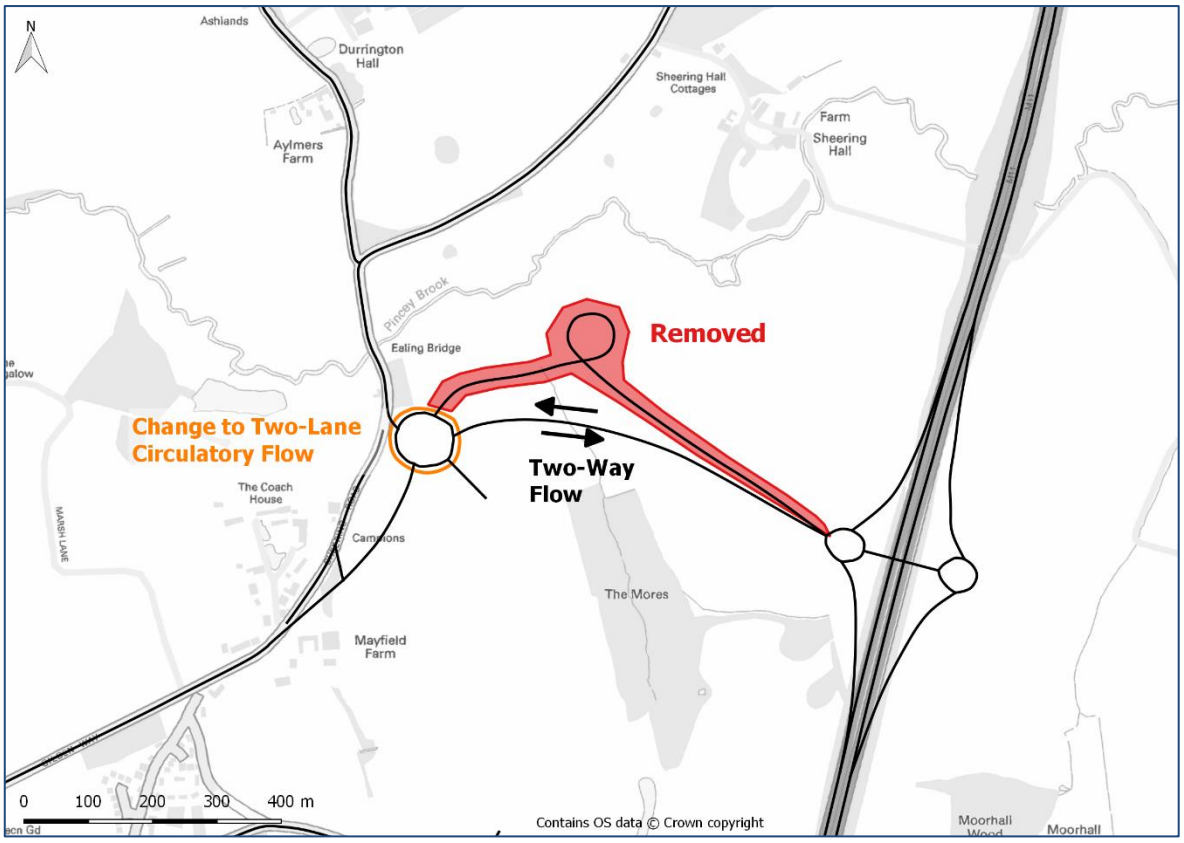
- **'without scheme'** network will include the committed infrastructure schemes within the area of detailed modelling expected to be completed by the opening, interim, design or final year (see Table 2-1). A log of each of these schemes will be produced, along with their level of uncertainty, and they will each be coded into the base highway networks. This will be based on consultation with ECC; and

- **'with scheme'** networks will have the committed infrastructure developments included in the 'without scheme' network for the corresponding year as well as the changes to the network associated with the latest designs of the schemes under assessment.

4.3.2 The design of the M11 J7a scheme has been altered for the latest modelling proposed for the FBC as illustrated in Figure 5-1 below. What was termed Phase 2b has been removed. These network revisions will be incorporated into the 'with scheme' scenarios. By way of background, the following bullet points detail the reasons for the removal of Phase2b from the FBC.

- Phase 2b has always been part of the future proofing of the Northern Bypass with the northern link (phase 2b being the east bound merge to the future bypass and the southern link being the west bound diverge).
- It has always been envisaged the construction would be done in phases with the junction and link to Harlow a top priority.
- The government in its funding decision proposed to fund the junction and the link which dovetailed with phased construction.
- The planning application and the PRA includes the Phase 2b however the planning application makes it clear that the scheme will be constructed in phases, therefore what the FBC will cover is only the first phase of that development.

Figure 4-1: M11 J7a latest network revisions



4.3.3 The latest 'with scheme' and 'without scheme' modelling will also include the following additional network revisions since Stage 3 (are also listed in Table 2-1):

- Old Road Closed for through access;
- Mulberry Green Left in and Left out;
- Signalisation of Second Avenue / Velizy Avenue Junction as part of capacity upgrades;

- Extra Eastbound Lane on Gilden Way;
- Part signalisation of Sheering Road roundabout to improve access to East Harlow development; and
- Left-turn slip road from J7a link road approach to the East Harlow northern access road.

4.3.4 Generalised cost parameters will be calculated for each of the future years/time periods, based on the methodology proposed in WebTAG Unit M4 utilising the November 2014 version. These generalised cost parameters, in PPM and PPK values, will be used to specify the appropriate assignment criteria by year, time period and user class.

5 Economic Appraisal

5.1 Introduction

5.1.1 The Economic Appraisal will provide updated economic information for the OBC with updated modelling output. This builds on the OBC which was produced in August 2017. It will comprise:

- An update of the EAR and the Economic Case of the OBC using the new NTEM modelling outputs for the core scenario and two new alternative growth scenarios;
- Sensitivity testing of the core scenario covering dependent development and low and high growth and additional assessment of the economic benefits attributed to dependent development to feature in the EAR;
- The production of a further brief Regeneration Report explaining that no regeneration benefits are to be claimed for the scheme;
- An updated brief explanation of Wider Impacts and an indicative number for Output Increase in Imperfectly Competitive Markets; and
- An update of the Social and Distributional Impacts Reports.

5.1.2 The methodology proposed is based on Phase Two of the Transport Business Cases guidance published by the DfT. The OBC follows the Strategic Outline Business Case (SOBC) and provides more detailed information for “Decision Makers” to confirm a preferred option and seek approval for further business case development.

5.1.3 The proposed economic appraisal methodology is outlined below. Traffic modelling will be completed in Autumn 2017 and work on producing the economic and environmental analysis for the updated OBC will begin in Autumn/Winter 2017. It is envisaged that this will be completed in Spring 2018.

5.2 Transport User Benefits Appraisal

5.2.1 For the primary Transport User Benefits Appraisal – which feeds into the AST and includes an assessment of the environmental and social impacts of the scheme, the Core (NTEM) 2036 growth scenario will be used (as if no assessment of dependent development had taken place).

5.3 Time and collisions savings

- Time savings will be calculated using TUBA for appraising scheme benefits after the opening year and QUADRO for appraising the impact of construction roadworks and maintenance. QUADRO will only be used for the core scenario (runs B and C as defined in Appendix A). We will use TUBA version 1.9.8.
- Collision savings will be calculated using COBA-LT (only for the core scenario runs B and C)
- Reliability using DfT’s guidance (only for the core scenario runs B and C).

5.4 Costs

- Costs (CAPEX and OPEX) will be analysed to present them according to economic appraisal requirements, as outlined in TAG unit A1-2 scheme costs.

5.5 Documentation

5.5.1 An EAR will be prepared that will comprise:

- Project background and scheme history and objectives;
- A description of the economic assessment methodology;

- An estimate of costs;
- An estimate of benefits and an appraisal summary comparing core scenario runs B and C (see Appendix A) including Transport Economic Efficiency (TEE), Public Accounts (PA) and Analysis of Monetised Costs and Benefits (AMCB);
- An estimate of the time saving benefits for the alternative scenarios and sensitivity tests outlined below; and
- Calculated benefits of dependent development sensitivity test.

5.5.2 The Economic Case of the OBC will be updated. The economic case will contain the following:

- Headline scheme benefits;
- TEE, PA and AMCB;
- The Appraisal Summary Table (AST); and
- A Value for Money statement including dependent development assessment.

5.5.3 The results of Wider Impacts, Social and Distributional analysis and Regeneration will be included alongside analysis of non-monetised impacts - where applicable, in the Value for Money statement.

5.6 Environmental Impacts

5.6.1 The following sub-sections outline the approach to the environmental appraisal for each of the following WebTAG topics (comparing core scenario runs B and C):

- Noise;
- Air quality;
- Greenhouse gases;
- Landscape/Townscape;
- Heritage of Historic Resources;
- Biodiversity; and
- Water environment.

Existing Knowledge and Data

5.6.2 The assessment is based upon guidance contained within TAG Unit A3: Environmental Impact Appraisal. This appraisal is being undertaken from information obtained during the Environmental Impact Assessment (EIA) process and presented in the Environmental Statement (ES) required for the Proposed Scheme. The ES covers many of the same impacts referred to in the ASR. The EIA process has also elicited environmental risks that could influence the Proposed Scheme and set out how these risks will be addressed during subsequent PCF stages.

5.6.3 WebTAG advises that at all stages, a proportionate approach should be adopted. Excessive detail should be avoided and the level of detail should be no more than is needed for robust decisions to be taken.

5.6.4 An environmental constraints plan has also been produced, showing environmental designations in the vicinity of the scheme. This is presented within the ES.

Stakeholder Input

5.6.5 Statutory environmental bodies such as Environment Agency, Historic England, Natural England and other relevant stakeholders were given the opportunity to inform the methodology for the appraisal of environmental impacts through a scoping report/scoping opinion. Key stakeholders have also responded to the planning application with comments and additional queries.

Environmental Impact Assessment (EIA)

5.6.6 An EIA has been undertaken in accordance with the Town and Country Planning (EIA) Regulations 2011 (Amendment 2015) and an Environmental Statement has been submitted to ECC planning authority as part of the planning application. It highlighted a number of topic areas where there could be a significant environmental effect as a result of the Proposed Scheme. The relationship between ASR and ES includes:

- Transport modelling informs the methodologies required for noise, air quality and water environment (HAWRAT) assessments under the Design Manual for Roads and Bridges (DMRB) approach; and
- In turn the output from the noise model informs the need for sound barriers (which affects the landscape assessment) and air quality changes could affect ecology receptors.

5.6.7 Traffic flow and speed figures resulting from transport modelling were used by the environmental specialists to carry out their environmental assessments for the ES. These traffic data have been checked and reported following the Interim Advice Note 185/15: Update traffic, air quality and noise advice' guidance, a supplementary document to DMRB. Traffic core medium scenario figures have been provided representing the most likely growth scenario for the area around the M11 corridor. It encompasses projected housing and employment developments from the emerging district Local Plans, planned growth at Stansted Airport, planned infrastructure schemes in the modelled area and background growth as predicted by TEMPRO. Two future years have been assessed; 2021, which represents the opening year of the M11 Junction 7a and 2036, which represents the horizon year, fifteen years after the Proposed Scheme is due to open.

5.6.8 The proposed methodologies are summarised in each section below.

Noise

5.6.9 The Proposed Scheme has the potential to result in noise impacts from changes in traffic volume and changes to the road infrastructure.

5.6.10 Noise needs to be assessed as a distributional impact.

5.6.11 The assessment of potential noise and vibration impacts will be undertaken following the guidance with DMRB Volume 11, Section 3, Part 7 HD 213/11 and the five steps approach in TAG Unit A3.

5.6.12 The level of assessment is determined following scoping assessment which has included a review of traffic data associated with the scheme. At this stage, a detailed assessment as defined in HD 213/11 has been completed. Assessment included the following:

- Definition of the study area and affected routes;
- Identification of Noise Sensitive Receptors (NSRs) within the study area, including both existing and any planned future receptors;
- Quantification of noise impacts. Noise calculations at all NSRs within the DMRB defined 'Calculation Area' using the Calculation of Road Traffic Noise, 1988;
- The noise predictions at NSRs then feed into the TAG Noise Workbook analysis to determine the Net Present Value of the Proposed Scheme and the change in noise annoyance for the population affected by the Proposed Scheme;

- The numbers of residential receptors exceeding 55 dB LAeq, 8hr at night for the design year, both with and without the scheme in place, have been provided to enable the noise impact from the scheme to be evaluated;
- Noise contour maps for change in noise level in the short-term (baseline year) and long-term (future year) are being produced, used in the Distribution Impact Assessment (if required); and
- Appropriate entries for the Appraisal Summary Tables for the scheme to be provided (as required), based on the guidance within TAG Unit A3.
- A further assessment will now be undertaken using the latest traffic data.

Air Quality

5.6.13 The main pollutant of concern is from vehicular emissions, principally nitrogen dioxide (NO_2) and particulate matter (PM_{10}).

5.6.14 Air quality needs to be assessed as a distributional impact.

5.6.15 The assessment of potential air quality impacts has been undertaken using traffic data following guidance contained within TAG Unit A3 using the six steps approach, and in accordance with the assessment methodology set out in DMRB HA 207/07, Interim Advice Notes (IAN 170/12, 174/13 and 175/13) have been followed with reference to Defra's LAQM TG (09) guidance where required. The assessment includes the following:

- Quantifying and assessing the change in emissions of NO2 and PM10 (local impacts) and NOx and CO2 (regional air pollution impacts) resulting from the Proposed Scheme compared with the Do-Minimum;
- Consideration of monetised impacts in the Value for Money Criteria; and
- Scope and, if appropriate, analysis of any distributional impacts of air quality in line with guidance contained within TAG Unit A4.2.

Greenhouse Gases

5.6.16 The key consideration is the change in carbon dioxide emissions from the modelled traffic scenarios with and without the Proposed Scheme.

5.6.17 Changes in the emission of traded and non-traded carbon (CO_2 equivalent tonnes) bought about by the Proposed Scheme is being estimated and a monetary valuation of the changes carried out. Calculations are being completed using Highways England's DMRB HA207/07 and Interim Advice Note 185/15 methodology and data from the traffic model. The output is to be monetised greenhouse gases impact over the 60 year appraisal period.

Landscape/Townscape

5.6.18 A detailed assessment has been carried out in accordance with DMRB Interim Advice Note 135/10 Landscape and Visual Effects to inform the qualitative landscape appraisals. The assessment has been completed for both day and night time situations and compared against the Do-Minimum scenarios in the following instances:

- During construction;
- In the winter of the year of opening (to represent a maximum effect situation, before any planted mitigation could take effect), taking account of the completed project and the traffic using it; and

- In the summer of the 15th year after project opening (to represent a least effect scenario, where any planted mitigation measures could be expected to be reasonably effective), taking account of the completed project and the traffic using it.

5.6.19 The study area is broadly defined by the Zone of Theoretical Visibility (ZTV).

5.6.20 The qualitative appraisal has been completed for impacts on landscape and townscape using TAG Unit A3 appropriate WebTAG worksheets summarising the overall assessment. The assessment is Step 1 (Scoping and identification of study area); Step 2 (identification of key environmental resources and describing their features); Step 3 (appraise environmental capital); Step 4 (appraise the impact of the Proposed Scheme) and Step 5 (determining an overall impact score).

Heritage of Historic Resources

5.6.21 A detailed assessment following TAG Unit A3 and in accordance with DRMB Volume 11 Section 3 Part 2 'Cultural Heritage' was carried out to inform the potential impacts on the cultural heritage and archaeology of the area. The assessment considered both physical impacts and the impact on the setting of these assets. The assessment was Step 1 (scoping and identification of study area); Step 2 (identification of key environmental resources and describing their features); Step 3 (appraise environmental capital); Step 4 (appraise the impact of the Proposed Scheme) and Step 5 (determining an overall impact score).

Biodiversity

5.6.22 A qualitative TAG assessment was undertaken. The five steps methodology defined in TAG Unit 3A were used to determine an overall assessment score using the staged approach detailed in DMRB Volume 11 Section 3 Part 4. This included having regard for the DMRB Interim Advice Note 130/10 and other relevant guidance including the Guidelines for Ecological Impact Assessment in the UK. The assessment was Step 1 (scoping and identification of study area); Step 2 (identification of key environmental resources and describing their features); Step 3 (appraise environmental capital); Step 4 (appraise the impact of the Proposed Scheme) and Step 5 (determining an overall impact score).

Water Environment

5.6.23 The assessment of the water environment was carried out using TAG Unit A3 and informed by guidance contained in the DMRB Volume 11 Section 3 Part 10 HD45/09 'Road Drainage and the Water Environment'. The assessment was required to identify potential effects during operation, and assess the magnitude and significance of effects in accordance with WebTAG. Traffic band resulting from traffic modelling was used to run the HAWRAT assessment which passed with incorporation of attenuation ponds and other mitigation (including oil interceptors). A Water Framework Directive (WDF) Compliance Assessment has also been completed. The assessment concluded that the scheme is WFD compliant. Significance of Effects

5.6.24 Environmental impacts have been expressed in terms of the significance of their effect, both positive and negative. These expected effects are documented within the ES under topic chapters and summarised within the conclusion and Executive Summary chapters. The significance of the overall environmental effects have been documented in the AST.

5.6.25 Impacts are defined within the ES as the changes resulting from an action and effects are defined as the consequences of impacts. The significance of the effect of an impact is derived through consideration of the sensitivity of a receptor (sometimes referred to as its value or importance) and the magnitude of the impact. The significance of the effect is influenced by both of these variables.

5.6.26 The significance of any particular environmental effect can typically be identified through the use of a matrix. A typical matrix provided in Table 2.4 of DMRB Volume 11, Section 2 Part 5 has been adopted for our assessment, and reproduced in Table 1.1 below.

Table 5-1: Typical Matrix for the Assessment of Significant Effects

Sensitivity or value	Magnitude of impact				
	No change	Negligible	Minor	Moderate	Major
Very high	Neutral	Slight	Moderate or Large	Large or Very Large	Large or Very Large
High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
Medium	Neutral	Neutral or Slight	Slight	Slight or Moderate	Moderate or Large
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

5.6.27 Matrices for individual topics may vary slightly in some instances. Consequently, the approach and relevant guidance used is explained within each topic chapter within the ES.

Scope for Mitigation

5.6.28 Mitigation measures aim to avoid effects at their source, perhaps through amendments to the Proposed Scheme detailed design or by regulating the timing or location of activities. If effects cannot be avoided or reduced, it may be appropriate for compensatory measures to be taken, for example to provide additional landscape screening on noise attenuation structures. Where appropriate, the measures to be used in mitigation have been and would be further developed in consultation with statutory organisations and/or other third parties as the detailed design progresses.

5.6.29 Mitigation measures identified in the topic assessments are summarised in the Register of Environmental Actions and Commitments (REAC) table in the outline EMP document. These will be incorporated into the outline Construction Environmental Methodology Report (CEMP) which will go forwards to the contractor for expansion and use as a working document.

Programme

5.6.30 At Stage 4/5 (April 2017 to April 2018) the environmental team is providing input to the illustrative design, economics report and business case (AST) based on updated traffic figures. Environment is providing detailed input to contract documents both for the ecological advanced works, advanced engineering works and the main contract. They are also applying for EPS licences for bats, great crested newts and badgers. Deliverables for this stage include separate Environmental Management Plans for advanced and main contracts, arboricultural method statement, tree protection plans, detailed illustrative landscape designs, landscape and ecological management plan.

5.6.31 Further environmental surveys have been undertaken to inform the detailed design and contract input. Works under EPS licence is seasonal and is required to take place during specified months. The EPS works along Gilden Way need to be completed prior to advanced works commencing on site. Environmental mitigation across the whole site for the main contract also needs to be undertaken prior to, during and after construction. These works are also subject to seasonal constraints.

5.7 Social Impacts

5.7.1 A report will be prepared to include the social impacts appraisal in line with the DfT TAG Unit A4.1.

5.7.2 The methodology includes a screening process to define the level of analysis required for the following social factors:

- Accidents;
- Physical activity;
- Security;
- Severance;
- Journey quality;
- Option and non-use values;
- Accessibility; and
- Personal affordability.

5.8 Distributional Impacts

5.8.1 The Distributional Impacts Appraisal is closely linked with the Social Impacts Appraisal. The Social Impacts Appraisal looks at the overall impact of a range of indicators that are not already part of economic or environmental assessments. The Distributional Impacts Appraisal looks at the extent to which the Scheme impacts affect different specific social groups. These may include: children, older people, people with a disability, Black, Asian and Minority Ethnic (BAME) communities, people without access to a car and people on low incomes.

5.8.2 A report will be produced in line with the DfT Distributional Impact Appraisal TAG Unit A4.2.

5.8.3 The table that follows outlines the analysis that will be undertaken.

Table 5-2: Distributional Analysis to be undertaken

Dataset / social group (Ticks indicate analysis required for each impact)	User Benefits	Noise	Air quality	Accidents	Security	Severance	Accessibility	Affordability
Income Distribution	✓	✓	✓				✓	✓
Children: proportion of population aged <16		✓	✓	✓	✓	✓	✓	
Young adults: proportion of population aged 16-25				✓			✓	
Older people: proportion of population aged 70+				✓	✓	✓	✓	
Proportion of population with a disability					✓	✓	✓	
Proportion of population of Black and Minority Ethnic (BME) origin					✓		✓	
Proportion of households without access to a car						✓	✓	
Carers: proportion of households with dependent children							✓	

5.9 Regeneration

5.9.1 This intervention is currently not regarded as likely to return regeneration benefits. A brief document will be produced to explain the rationale behind this position.

5.10 Wider Impacts (WI)

5.10.1 It is proposed to undertake induced investment analysis to include the dependent development assessment mentioned above and to include an indicative number for WI2 Increase in Output in Imperfectly Competitive Markets will be provided following DfT's TAG Unit A2.1. The calculation of other wider impacts is regarded as too onerous and not the main focus of this scheme. Commentary will be provided to explain what can be expected for the remaining WI.

5.11 Sensitivity Testing and Alternative Scenarios

5.11.1 The following sensitivity tests will be carried out:

- Low growth
- High growth
- ECC Most Likely
- High-Emerging LP
- Dependent Development

5.11.2 The first four tests outlined above, i.e. Low, High, ECC Most Likely and High-Emerging LP tests will be assessed using TUBA 1.9.8 and indicative numbers from QUADRO and COBA-LT taken from the Core Scenario (NTEM) runs.

Dependent Development

5.11.3 WebTAG Units A2.3[13] provide guidance on the inclusion of 'dependent development' in economic scheme appraisal. Dependent development is defined as 'residential or non-residential development on a specific plot of land, which can only proceed with complementary transport investment'. The development is therefore dependent on the provision of a transport scheme for the road network to provide a 'reasonable level' of service to new and/or existing users.

5.11.4 A sensitivity test of the core scenario will be carried out in line with guidance; the Transport User Benefits Appraisal will be carried out without dependent development included in calculations. Appendix A details the identification of dependent development and the various scenarios that need to be created and used.

5.11.5 This test will focus on assessing the benefits of the transport scheme in isolation and assessing the benefits of the dependent development. The methodology will comprise the following steps:

1. Outlining dependency tests results
2. Appraisal of transport scheme in isolation: This assessment will include only time benefits estimated using TUBA (i.e. excluding, Vehicle Operating Costs, Indirect Taxation, COBA-LT, QUADRO or environmental assessments). The NVB and BCR will be estimated using Scenarios A and D. The information from this test will be reported in the TEE, PA and AMCB tables.
3. Outlining the number of dependent homes unlocked and their hectarage

[13] Unit A2.3 'Transport Appraisal in the Context of Dependent Development' published by the DfT in July 2015

4. Evaluating and reporting changes in land values due to changes in land use, using the "Valuing Housing Impacts Workbook".
5. Calculating and reporting transport external costs: Estimating transport external costs caused by the new homes using Scenarios C and D and comparing them to the external costs obtained in the dependency test produced in step 1. This external costs will only include time benefits.
6. Calculating and reporting net benefits of the housing (i.e. Step 4 minus Step 5)
7. Identifying additional infrastructure investment required to unlock the housing (e.g. new schools, water, electricity and other)
8. Producing a Dependent Development Value for Money assessment following the qualitative assessment guidelines suggested in TAG Unit A2.3:

Benefits	**Score**
Greater than £100m	Large beneficial
Between £100m and £25m	Moderate beneficial
Between £25m and zero	Slight beneficial
Zero	Neutral
Between zero and -£25m	Slight adverse
Between -£25m and -£100m	Moderate adverse
Less than -£100m	Large adverse

5.12 Risks and Issues

5.12.1 In terms of the scenarios being modelled, advice has been sought from the client on defining the growth scenarios to be modelled. With NTEM the latest version available at the time of the work will be used. Should any further modelling work be undertaken, it would be recommended to update to the latest version available at that time.

5.12.2 The following key risks and issues with this approach have been identified:

- The core scenario modelled will differ from the final published Local Plans of the four key Districts.
- The scheme was designed to the level of growth that ECC considered most likely in 2016. There is a risk that further work may be required to ensure that current scheme designs will accommodate the level of growth that ECC believe is now likely by 2036.
- The DfT consulted on new guidance for WebTAG in 2016. This included new guidance on dependent development. It is not yet known when the definitive guidance might be changed to reflect the outcomes from the consultation. However, the DfT have advised that in the mean time we should proceed following the current guidance.
- The scheme has been identified prior to the dependent development tests taking place. Thus it will not be necessary to undertake Step 2 as set out in WebTAG for modelling dependent development which states that "if a low cost transport scheme can be shown to resolve the dependency, any more costly transport schemes should be tested as increments to the low cost transport scheme."
- Dependent development has not been identified through the modelling previously and the results from this work are not known. Dependent development is to be modelled as a sensitivity test for the core scenario only. Other impacts such as accidents and those on the environment will not be tested in terms of dependent development.

6 Summary

6.1.1 An Appraisal Summary Table (AST) will be produced following as per Web TAG (https://www.gov.uk/government/publications/webtag-appraisal-tables). This table will contain a summary of all the assessments undertaken for the Core Scenario (NTEM). This will include the following:

- Transport users and providers benefits estimated using TUBA;
- Reliability using a stress test approach;
- Wider impacts as set out in section 5.10;
- Environmental as set out in section 5.6;
- Social Impacts as set out in section 5.7; and
- Public Accounts using the PA table.

Appendix A - Dependent Development

A.1 Modelling of Dependent Development

A.1.1 Incorporation of dependent development into the economic appraisal of the M11 J7a scheme will be undertaken in three steps:

- **Step 1:** Determine the quantity of new development that should be regarded as dependent on the transport scheme;
- **Step 2:** Assess the transport user benefits of the transport scheme in the absence of the dependent development
- **Step 3:** Assess the external costs and estimate the benefits of the dependent development assuming the transport scheme is provided

A.1.2 An additional step (after Step 1) is referenced in the guidance, related to the identification of an 'appropriate scheme' required to restore a reasonable level of service to the road network. It is understood that this step would not be undertaken at Stage 4/5 of the Transport Appraisal Process given the transport scheme has already been identified. Instead Step 1 will seek to determine the level of development dependent on the identified scheme.

A.1.3 It is proposed that the VDM is used to produce model outputs (e.g. time and distance skims) to feed into the economic appraisal. Consideration of variable demand should provide the most robust assessment of future-year traffic conditions.

A.1.4 The process of identifying the quantum of dependent development (Step 1), using the VISUM model, is outlined in the following section.

A.2 Determining the Quantum of Dependent Development

A.2.1 To determine the quantum of dependent development, two WebTAG-defined scenarios14 will be modelled:

- Scenario A – without the housing development and without any form of transport scheme; and
- Scenario B – with the housing development and without any form of transport scheme

Scenario A will be based on the High - Emerging LP 2036 scenario (see 5.2.4) with Local Plan development removed and with no subsequent re-factoring to TEMPro. Scenario B will use the High - Emerging LP 2036 scenario as previously modelled.

The highest quantum of dependent development identified across the AM, IP and PM scenarios will be taken forward for Steps 2 and 3.

A.2.2 A comparison of model outputs from Scenarios A and B will be undertaken to evaluate the impact of development on the capacity of the existing road network. Focus will be placed on key routes across the network that are most likely to be impacted by journeys from the larger proposed developments in Greater Harlow, including Gilston and Latton Priory, routing to/from the M11 via Junctions 7 and 8. Such routes will include the A414 and A1184.

A.2.3 The road network will be deemed to be 'reaching capacity' and unable to provide a reasonable level of service if local forecast traffic flows are shown to exceed 90% of the capacity of the existing road network along the identified key routes between the large development areas and the M11 – resulting in significant journey time delays.

[14] Scenarios as defined in WebTAG Unit A2.3 'Transport Appraisal in the Context of Dependant Development' – July 2015

A.2.4 Developments will be considered ‘dependent’ if associated development trips are assigned along key routes to/from the M11 that are modelled to exceed capacity and can no longer provide a reasonable level of service in Scenario B. Should the existing local road network be shown to exceed capacity in Scenario A, then all additional development will be considered ‘dependent’, and modelling of Scenario B will not be required.

A.2.5 Housing developments of less than 200 dwellings that are calculated to contribute only a small number of trips (around 1 per minute) to flows at key locations will be assumed not to be dependent on the scheme. Larger developments that are included in the assessment will be grouped, where feasible, into geographic ‘clusters’ to reduce the scope of the modelling and the scope of any required sensitivity testing (as outlined below).

A.2.6 Sensitivity testing will be undertaken, if required, to determine the ‘tipping point’ at which the existing road network can no longer provide a reasonable level of service. The sensitivity testing will involve reducing the level of development proposed at the larger proposed sites in line with the scale of excess demand modelled along the key routes to/from the M11. As it is proposed to carry out the assessment using development ‘clusters’, the reduction in the level of development will be proportioned across the clustered sites. The sensitivity testing will be used to determine the proportion of development across the larger proposed sites that can potentially be accommodated by the existing road network and which is therefore not dependent on the M11 J7a scheme being built.

A.2.7 As mentioned earlier, an interim step of the transport appraisal in the context of dependent development is the identification of an appropriate transport scheme. However, given the scheme has already been identified, it is possible that the proposed layout of M11 J7a could be insufficient to provide a reasonable level of service to users and accommodate all dependent development in the area for the core scenario. Should this transpire, the quantum of dependent development associated with the proposed scheme will require re-evaluation.

A.2.8 Following sensitivity testing, Scenario B will be created with the established quantum of dependent development. This scenario will then be taken forward to the User Benefits Appraisal (Steps 2 and 3) and used as a basis for developing further WebTAG-defined Scenarios A, B, C and D (see section A.3).

A.2.9 For the Core scenario the level of dependent development at each site will be derived from the housing and employment assumptions that define the scenario up to the maximum derived in the High - Emerging LP scenario.

A.3 Dependent Development Scenarios

A.3.1 Once the quantum of dependent development for the core scenario has been established, WebTAG-defined scenarios will be modelled to assess the transport user benefits of the scheme without dependant development (Step 2) and benefits and external costs of the scheme with dependant development as a sensitivity (Step 3), as follows:

- Scenario A – without dependent development and without the transport scheme
- Scenario B – with dependent development but without the transport scheme
- Scenario C – with dependent development and with the transport scheme; and
- Scenario D – without the dependent development but with the transport scheme

To undertake Step 2, the updated transport user benefit assessment will be carried out using outputs taken from VISUM model runs for Scenarios A and D, with the difference in outputs used to appraise the impact of M11 J7a without dependent development.

To undertake Step 3, the assessment will be carried out using outputs taken from VISUM model runs from Scenarios C and D, with the difference in outputs used to assess the external costs of the proposed development.

The following modelled scenarios will therefore be run in VISUM to be fed into the economic appraisal of the scheme – 24 in total:

Table 6-1: Modelled scenarios required for economic scheme appraisal

Core (NTEM)			ECC Most Likely			High – Emerging LP		
AM	IP	PM	AM	IP	PM	AM	IP	PM
Scenario A,B,C & D	Scenario A,B,C & D	Scenario A,B,C & D	Scenario A,B,C & D	Scenario A,B,C & D	Scenario A,B,C & D	Scenario A,B,C & D	Scenario A,B,C & D	Scenario A,B,C & D
High Growth			**Low Growth**					
AM	IP	PM	AM	IP	PM			
Scenario A,B,C & D	Scenario A,B,C & D	Scenario A,B,C & D	Scenario A,B,C & D	Scenario A,B,C & D	Scenario A,B,C & D			